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1. Subbasin Assessment – Watershed Characterization

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 U.S.C. 1251). States and tribes, pursuant to section 303 of the CWA are to adopt water quality standards (WQS) wherever attainable necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet WQS. States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve WQS. This document addresses the water bodies in the South Fork Clearwater River (SF CWR) Subbasin that have been placed on what is known as the "303(d) list."

The overall purpose of this subbasin assessment (SBA) and TMDL is to characterize and document pollutant loads and set load allocations to meet existing WQS within the SF CWR Subbasin. The first portion of this document, the SBA, is partitioned into four major sections: watershed characterization, water quality concerns and status, pollutant source inventory, and a summary of past and present pollution control efforts (Chapters 1 – 4). This information is used to develop a TMDL for each pollutant of concern for the SF CWR Subbasin (Chapter 5).

1.1 Introduction

In 1972, Congress passed public law 92-500, the Federal Water Pollution Control Act, more commonly called the Clean Water Act. The goal of this act is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Water Pollution Control Federation 1987). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment is protecting and managing waters to insure "swimmable and fishable" conditions. This goal, along with a 1972 goal to restore and maintain chemical, physical, and biological integrity, relates water quality with more than just chemistry.

Background

The federal government, through the U.S. Environmental Protection Agency (USEPA), assumed the dominant role in defining and directing water pollution control programs across the country. The Idaho Department of Environmental Quality (DEQ) implements the CWA in Idaho, while the USEPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities. The USEPA implements the CWA on the Nez Perce Reservation. Because this document addresses water quality issues pertaining to the authorities of DEQ, USEPA and the Nez Perce Tribe (NPT), it has been prepared under the auspices of a Memorandum of Agreement (Appendix A).

Section 303 of the CWA requires DEQ and tribes to adopt, with USEPA approval, WQS and to review those standards every three years. Additionally, DEQ and tribes must monitor waters to identify those not meeting WQS. For those waters not meeting standards, DEQ and tribes must establish TMDLs for each pollutant impairing the waters. Further, states and tribes must set appropriate controls to restore water quality and allow the water bodies to meet their designated uses. These requirements result in a list of impaired waters, called the "303(d) list." This list describes water bodies not meeting WQS. Waters identified on this list require further analysis. A SBA and TMDL provide a summary of the water quality status and allowable TMDL for water bodies on the 303(d) list. This document, the *South Fork Clearwater River Subbasin Assessment and Total Maximum Daily Loads,* provides this summary for the currently listed waters in the SF CWR Subbasin.

The SBA sections of this report (Chapters 1 – 4) include an evaluation and summary of the current water quality status, pollutant sources, and control actions in the SF CWR Subbasin to date. While the SBA is not a requirement of the TMDL, USEPA, DEQ, and the NPT completed this assessment to ensure impairment listings are up to date and accurate.

The TMDL is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allow that water body to meet WQS (40 CFR §130). Consequently, a TMDL is specific to a water body and each of its pollutants. The TMDL also includes pollutant allocations among various sources of the pollutant. The USEPA considers certain unnatural conditions, such as flow alteration, a lack of flow, or habitat alteration, that are not the result of the discharge of a specific pollutant as "pollution." TMDLs are not required for water bodies impaired by pollution, but not by specific pollutants. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.

Idaho and Tribal Roles

Idaho and tribes adopt WQS to protect public health and welfare, enhance the quality of water, and protect biological integrity. A WQS defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

The state and/or tribe may assign or designate beneficial uses for particular Idaho water bodies to support. State of Idaho beneficial uses are identified in the Idaho WQS and include:

- Aquatic life support – cold water, seasonal cold water, warm water, salmonid spawning, modified

- Contact recreation – primary (swimming), secondary (boating)

- Water supply – domestic, agricultural, industrial

- Wildlife habitats, aesthetics, special resource water, and outstanding resource water

The Idaho legislature designates uses for water bodies on state lands. Industrial water supply, wildlife habitat, and aesthetics are designated beneficial uses for all water bodies in the state. If a water body is unclassified, then cold water aquatic life and primary or secondary contact recreation are used as additional default designated uses when water bodies are assessed (IDAPA 58.01.02.101.01.a).

An SBA entails analyzing and integrating multiple types of water body data, such as biological, physical/chemical, and landscape data to address several objectives:

- Determine the degree of designated beneficial use support of the water body (i.e., attaining or not attaining WQS).
- Determine the degree of achievement of biological integrity.
- Compile descriptive information about the water body, particularly the identity and location of pollutant sources.
- Determine the causes and extent of the impairment when water bodies are not attaining WQS.

1.2 Physical and Biological Characteristics

The majority of text and statistics in this section are taken directly from the *South Fork Clearwater River Biological Assessment* (USFS 1999), and the *South Fork Clearwater River Landscape Assessment* (USFS 1998).

The SF CWR Subbasin is located in north-central Idaho and encompasses an area of approximately 1,175 square miles (752,000 acres) with a 207 mile perimeter (Figure 1). The subbasin extends from the headwaters above Elk City (elevation 6,382 feet) to the confluence with the Middle Fork of the Clearwater River at Kooskia, Idaho (elevation 1,280 feet). The lower 12.8 miles of the SF CWR main stem flow through the NPT Reservation. The NPT Reservation encompasses 84,035 acres of the subbasin.

Idaho State Code divides the SF CWR Subbasin into 82 numbered water bodies (IDAPA 58.01.02.120.07). These are the water body units to which the 303(d) list applies and which this document refers to by name and number. Table 1 lists the major watersheds, their associated water bodies, water body numbers, and their number of acres. Figure 2 shows the distribution of the water bodies throughout the SF CWR Subbasin.

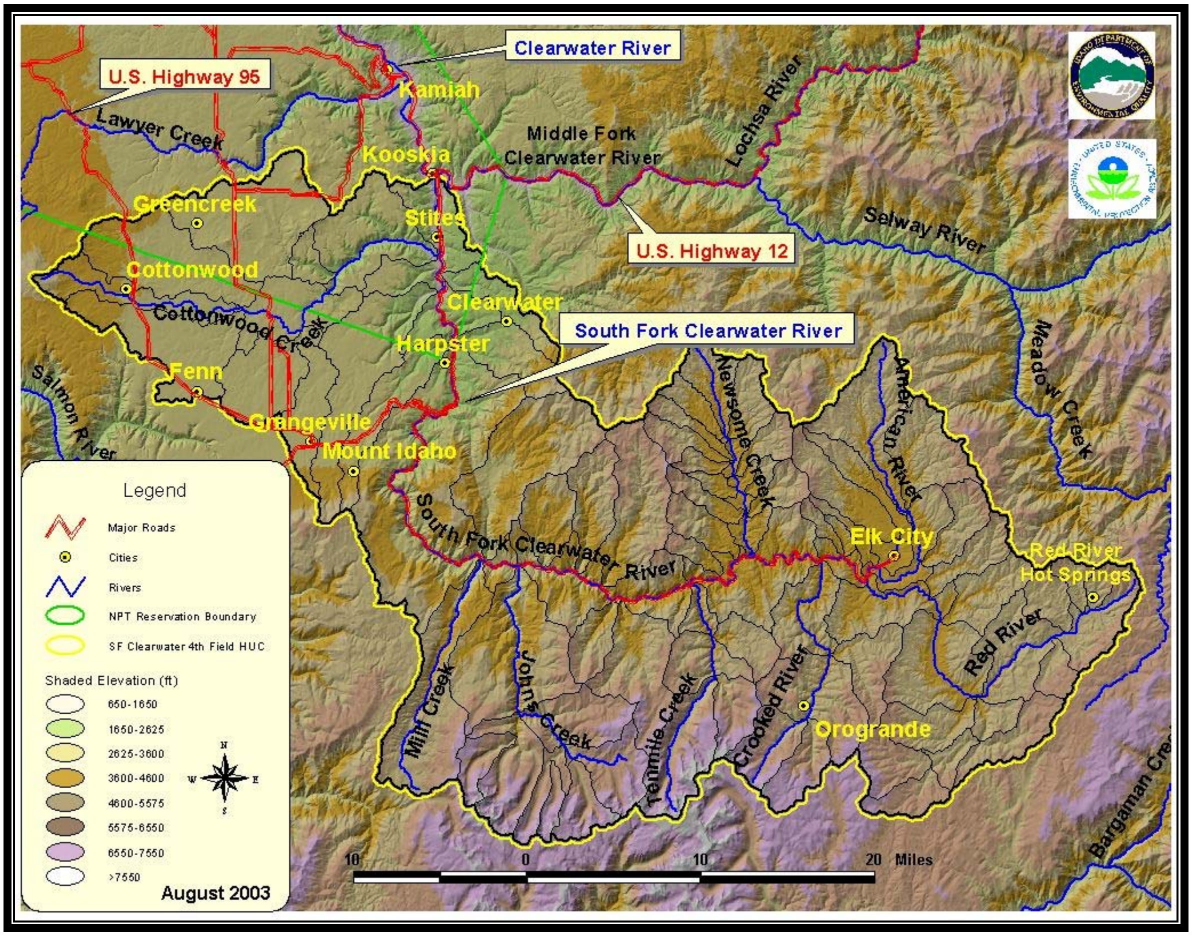

Figure 1. The South Fork Clearwater River Subbasin in North-Central Idaho

Table 1. SF CWR Subbasin watersheds, water bodies, and acreages.

Watershed/Water Body	Acreage
South Fork Clearwater River	115,223
WB 1 – Lower South Fork Clearwater River	19,723
WB 12 – Mid-Lower South Fork Clearwater River	56,690
WB 22 – Middle South Fork Clearwater River	18,950
WB 30 – Mid-Upper South Fork Clearwater River	17,165
WB 36 – Upper South Fork Clearwater River	2,695
Threemile Creek	21,440
WB 10 – Threemile Creek	
Butcher Creek	10,000
WB 11 – Butcher Creek	
Mill Creek	23,249
WB 13 – Mill Creek	

Watershed/Water Body	Acreage
Johns Creek	72,150
WB 14 – Lower Johns Creek	26,300
WB 15 – Gospel Creek	10,830
WB 16 – West Fork Gospel Creek	4,465
WB 17 – Middle Johns Creek	10,180
WB 18 – Upper Johns Creek	8,660
WB 19 – Moores Creek	3,960
WB 20 – Square Mountain Creek	2,270
WB 21 – Hagen Creek	5,520
Wing Creek	5,329
WB 23 – Wing Creek	
Twentymile Creek	14,545
WB 24 –Twentymile Creek	
Tenmile Creek	34,410
WB 25 – Lower Tenmile Creek	2,500
WB 26 – Middle Tenmile Creek	7,230
WB 27 – Upper Tenmile Creek	13,630
WB 28 – Williams Creek	5,900
WB 29 – Sixmile Creek	5,150
Crooked River	45,659
WB 31 – Lower Crooked River	9,470
WB 32 – Upper Crooked River	14,470
WB 33 – West Fork Crooked River	7,580
WB 34 – East Fork Crooked River	6,670
WB 35 – Relief Creek	7,470
Red River	103,348
WB 37 – Lower Red River	10,200
WB 38 – Middle Red River	16,000
WB 39 – Moose Butte Creek	7,050
WB 40 – Lower South Fork Red River	3,100
WB 41 – Middle South Fork Red River	2,700
WB 42 – West Fork Red River	6,370
WB 43 – Upper South Fork Red River	4,730
WB 44 – Trapper Creek	7,060

Watershed/Water Body	Acreage
WB 45 – Upper Red River	19,000
WB 46 – Soda Creek	3,340
WB 47 – Bridge Creek	3,260
WB 48 – Otterson Creek	2,460
WB 49 – Trail Creek	4,540
WB 50 – Siegel Creek	7,760
WB 51 – Red Horse Creek	5,800
American River	58,612
WB 52 – Lower American River	7,216
WB 53 – Kirks Fork American River	6,258
WB 54 – East Fork American River	11,500
WB 55 – Upper American River	15,275
WB 56 – Elk Creek	2,324
WB 57 – Little Elk Creek	5,081
WB 58 – Big Elk Creek	8,821
WB 59 – Buffalo Gulch	2,139
Whiskey Creek	1,660
WB 60 – Whiskey Creek	
Maurice Creek	1,094
WB 61 Maurice Creek	
Newsome Creek	42,576
WB 62 – Lower Newsome Creek	4,144
WB 63 – Bear Creek	3,831
WB 64 – Nugget Creek	1,450
WB 65 – Beaver Creek	3,732
WB 66 – Middle Newsome Creek	1,134
WB 67 – Mule Creek	5,498
WB 68 – Upper Newsome Creek	6,354
WB 69 – Haysfork Creek	3,170
WB 70 – Baldy Creek	2,723
WB 71 – Pilot Creek	3,916
WB 72 – Sawmill Creek	1,768
WB 73 – Sing Lee Creek	1,554
WB 74 – West Fork Newsome Creek	3,303

Watershed/Water Body	Acreage
Leggett Creek	4,918
WB 75 – Leggett Creek	
Fall Creek	2,334
WB 76 – Fall Creek	
Silver Creek	16,509
WB 77 – Silver Creek	
Peasley Creek	9,112
WB 78 – Peasley Creek	
Cougar Creek	7,731
WB 79 – Cougar Creek	
Meadow Creek	24,115
WB 80 – Meadow Creek	
Sally Ann Creek	8,890
WB 81 – Sally Ann Creek	
Rabbit Creek	6,190
WB 82 – Rabbit Creek	

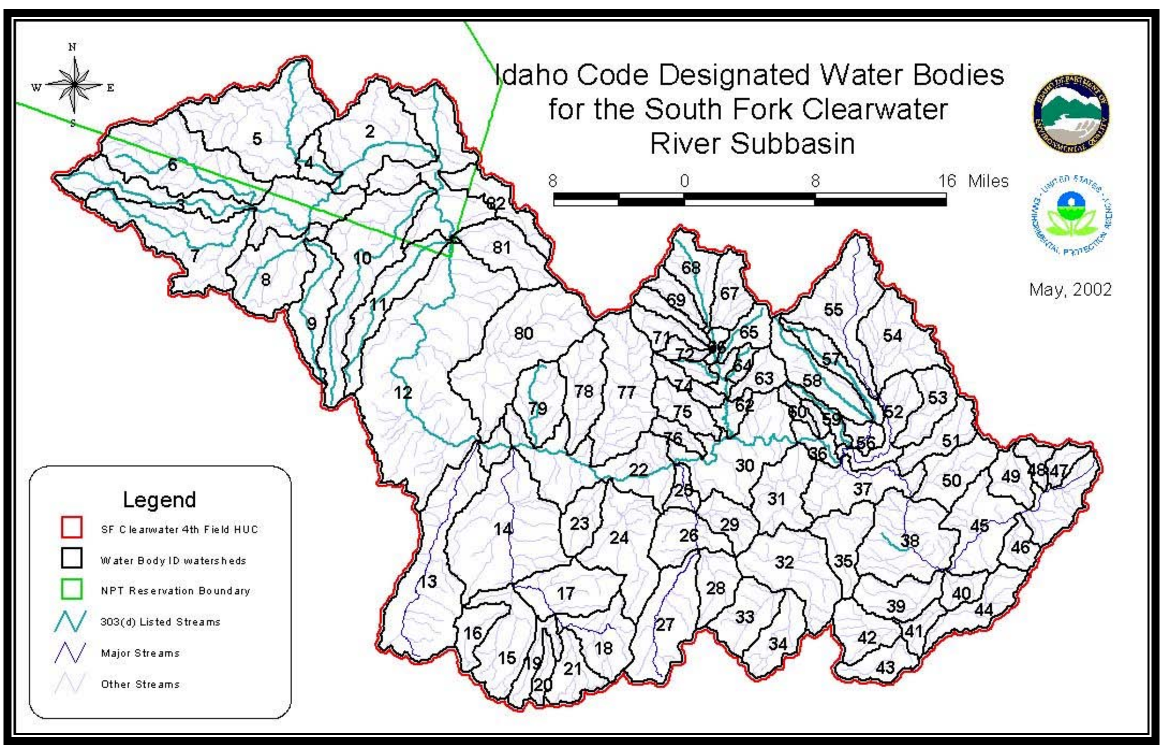

Figure 2. Water Bodies and Water Body Numbers in the SF CWR Subbasin

Climate

Northern Idaho is dominated by Pacific maritime air masses and prevailing westerly winds. Over 85% of the annual precipitation occurs during the fall, winter, and spring months. Cyclonic storms consisting of a series of frontal systems moving east produce long duration, low-intensity precipitation during this period of the year. In winter and spring, this inland maritime regime is characterized by prolonged gentle rains, fog, cloudiness, and high humidity; with deep snow accumulations at higher elevations. Winter temperatures are often 15 to 25 ^{o}F warmer than the continental locations of the same latitude. The climate during the summer months is influenced by stationary high-pressure systems over the northwest coast. These warm dry systems result in only 10-15% of the annual precipitation falling during the summer. Figure 3 shows precipitation distribution and climatic stations. Table 2 summarizes climatic information from several stations in the area of the SF CWR Subbasin.

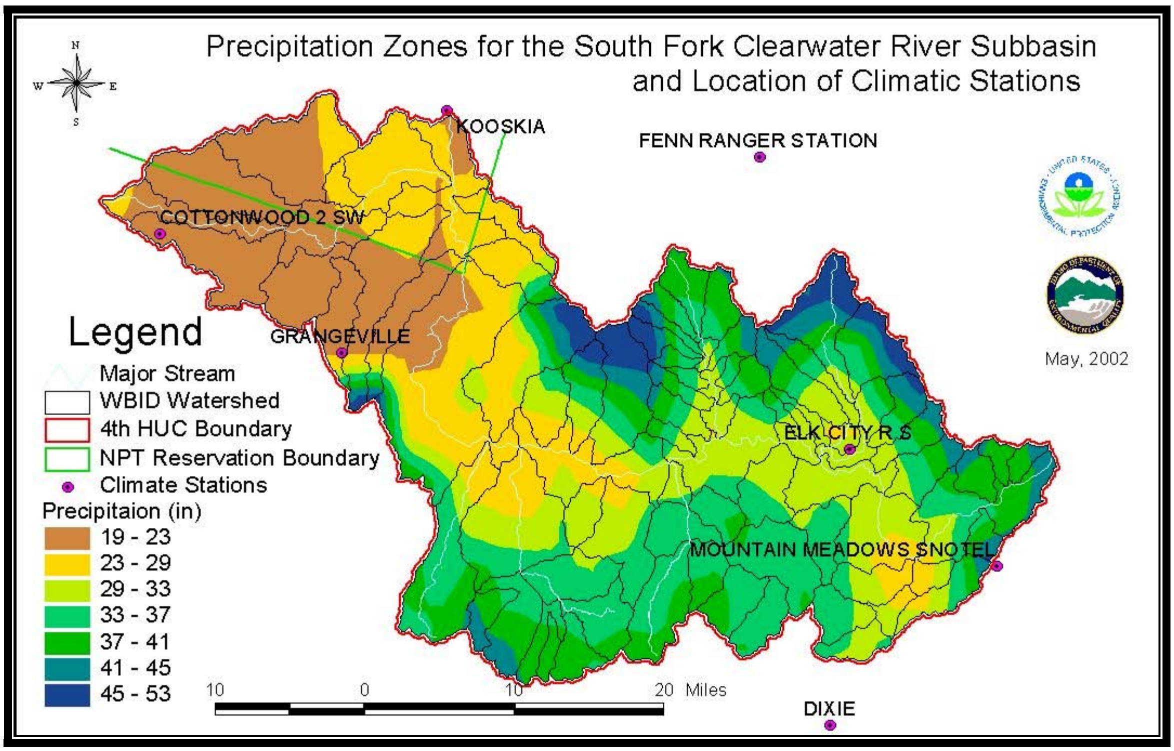

Figure 3. Climatic Stations and Precipitation Zones in the SF CWR Subbasin

Table 2. Summary of climatic data for various stations in and around the SF CWR Subbasin.

Station Name	Elevation (feet)	Period of Record	Mean Annual Temperature (ºF)	Mean Annual Precipitation (inches)	Avg. Number of Days Above 90ºF Per Year
Cottonwood	3,950	1950-2000	46.5	22.5	5.5
Dixie	5,620	1952-2000	36.2	28.5	1.2
Elk City	4,060	1950-2000	41.3	30.2	12.2
Fenn	1,590	1948-2000	49.1	38.1	40.5
Grangeville	3,360	1948-2000	46.3	23.8	14.0
Kooskia	1,280	1908-2000	50.4	24.2	53.2
Mountain Meadows	6,360	1989-2000	34.5	45.8	0.1

Subbasin Characteristics

The subbasin hydrography, hydrology, geology, landforms, and soils are described below.

Hydrography

The SF CWR flow regime reflects the annual precipitation and temperature patterns. Precipitation in the subbasin ranges from 25 inches at the lower elevations to over 50 inches at the higher elevations. Ten percent of the annual precipitation in Kooskia falls as snow, whereas 40% of the precipitation in Elk City is snow. Annual runoff from the SF CWR Subbasin averages about 12 inches, as measured by the U.S. Geological Survey (USGS) stream gage at Stites. Mean annual streamflow at Stites, the lower end of the subbasin, is 1,060 cubic feet per second (cfs). Streamflows are highest in May with an average of 3,370 cfs. Flows are lowest in September with an average of 258 cfs.

The SF CWR typically experiences annual flood peaks during late April, early May, or early June. An average spring runoff peak at Stites is about 5,000 to 7,000 cfs. The largest flood of record was on June 8, 1964, with an estimated peak of 17,500 cfs. Floods occasionally result from snowmelt or rain-on-snow between November and March. An analysis of peak flow records at Stites shows that 15% of flood peaks occurred during this period. Only 5% of flood peaks occurred during these months upstream near the forest boundary as shown by historic gaging station records. Further upstream, near Elk City, only 3% of flood peaks occurred during these months. These differences show the transition of climatic conditions from the lower to upper parts of the subbasin, as well as the relative dominance of peak flows during spring runoff.

The major tributaries in the upper reaches of the SF CWR watershed (i.e., American River, Red River, Crooked River, and Newsome Creek) have a runoff regime very similar to the main stem. They drain large areas of rolling upland terrain and typically do not have a flashy response to floods due to elevation, climate, relatively deep soils, forest vegetation, and moderate topography.

The runoff regimes of tributaries between Newsome Creek and the Nez Perce National Forest (NPNF) boundary in the lower part of the subbasin are relatively complex, and depend on size, elevation, and landform. For example, Johns Creek and Tenmile Creek drain high elevation terrain in their headwaters and mid- to low-elevation breaklands in their lower reaches. Due to the high elevation headwaters, peak flows often occur several weeks later in the spring than the upper subbasin streams. Medium size, mid-elevation tributaries, including Silver Creek, Mill Creek, Twentymile Creek, and Meadow Creek have a similar runoff regime to the major upper basin streams described above. The smaller tributaries in this reach of the South Fork Canyon often originate on low elevation breaklands that are subject to winter rain-on-snow events or spring and summer thunderstorms. These events can produce localized floods and debris torrents.

Butcher Creek, Threemile Creek, and Cottonwood Creek drain the Camas Prairie and have a significantly different runoff regime. They often have their annual peak flows in the midwinter, associated with rain-on-snow or rapid snowmelt events. Spring rains can also produce peak flows in these streams. These streams experience low flows earlier in the season than upstream tributaries.

Hydrology

Four basic hydrologic zones have been described in the SF CWR Subbasin by the NPNF (USFS 1999).

Zone 1- High Elevation Mountains. This includes those areas above 6,000 feet, often on glaciated landforms. Annual precipitation is typically 40-60 inches. High snow accumulations and relatively late, prolonged snowmelt are common. Stream channels are highly variable within this zone ranging from very steep, confined headwater streams to relatively flat channels located in glaciated valleys. Examples in this zone include upper Johns Creek and Tenmile Creek.

Zone 2- Mid Elevation Rolling Uplands. This zone is typically between 4,000 and 6,000 feet elevation with relatively low relief rolling hills. Annual precipitation is 30 to 40 inches. These areas have a moderate annual snow pack and snowmelt in May. Stream channels range in size and flow through relatively steep confined headwaters to low gradient, unconfined alluvial valley bottoms. This zone covers the largest portion of the SF CWR Subbasin and is best exemplified by the tributaries of Red River, American River, Newsome Creek, and Crooked River.

Zone 3- Low Elevation Breaklands. This zone is less than 4,000 feet in elevation and is comprised of steep sideslopes in the major stream and river canyons. Precipitation is typically 20 to 30 inches per year, with a low to moderate snow pack. The runoff regime is complex with a mix of snowmelt, rain-on-snow, and heavy rain resulting in peak runoff events. These occur typically in early spring. Streams are generally confined to steep valley walls with gradients that vary. Debris torrents are relatively common in smaller drainages. This zone is found all along the South Fork Canyon and up the major drainages.

Zone 4- Low Elevation Plateaus. This zone is less than 4,000 feet in elevation and has a rolling topography. Annual precipitation is 20 to 30 inches. The snow pack is low to moderate. The runoff regime is mixed with snowmelt, rain-on-snow, and heavy rain resulting in peak flows at varying times from midwinter to early spring. This zone is best exemplified by the Camas Prairie tributaries: Butcher Creek, Threemile Creek, and Cottonwood Creek.

Figure 4 shows the mean monthly hydrographs as expressed as percent of annual flow from stream gages representative of the hydrologic zones within the SF CWR Subbasin. The Zone 1 plot is from Johns Creek, Zone 2 is from the SF CWR near Elk City, and Zones 3 and 4 are from Lapwai Creek. Although it is not in the SF CWR Subbasin, Lapwai Creek was used as the example for Zones 3 and 4, because it is the only stream draining the Camas Prairie with a long term gaging record.

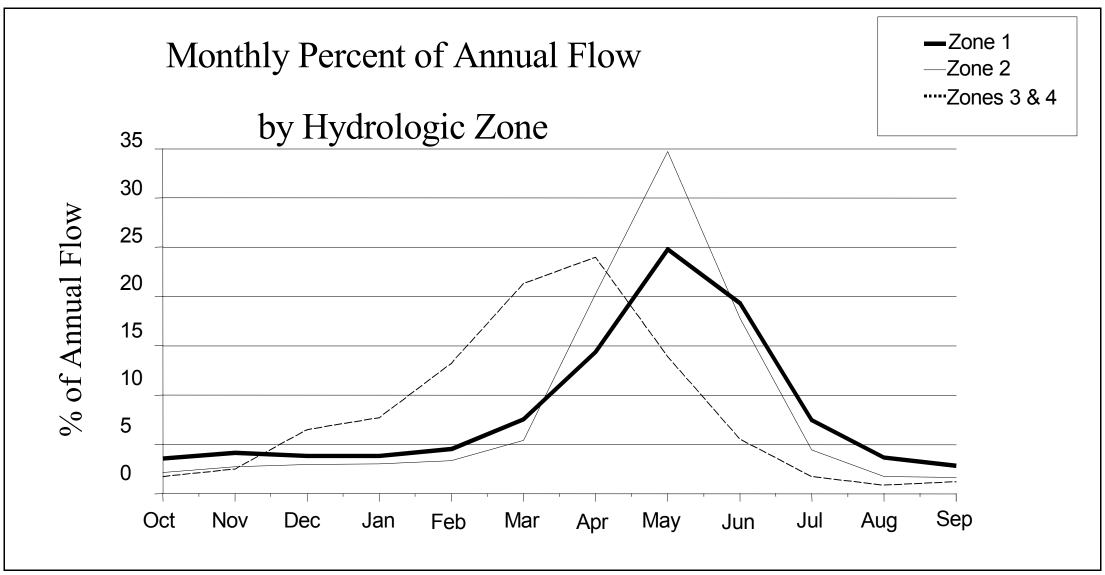

Figure 4. Monthly Percent of Annual Flow

Since the figures are expressed as percentages, the plots do not represent the relative magnitude of flow, but rather the distribution of flow over the water year (October 1-September 30). For example, the relatively large percentage of flow in the month of May in Zone 2 does not necessarily represent a higher peak flow from this zone, but rather that the peak flow consistently occurs in the month of May. This is in contrast to Zones 3 and 4, where peak flows commonly occur during any of several months, depending on annual weather conditions.

Geology, Landforms, and Soils

Landform groups are broad ecological land units that possess unique patterns of landform, geology (Figure 5), vegetation (Figure 6), climate, soils, and disturbance regimes. The SF CWR Subbasin is comprised of seven landform groups (LFGs). A summary description of each of these landforms, soils, erosional hazards, and vegetation follows. Aquatic landtype associations (ALTAs) have also been used to characterize the SF CWR Subbasin (Figure 7). The ALTAs emphasize patterns of stream networks and terrestrial-aquatic interactions that consider landform, geology, elevation, ground water temperatures, and hydrologic disturbance regimes. The LFG descriptions that follow include the corresponding ALTAs for reference.

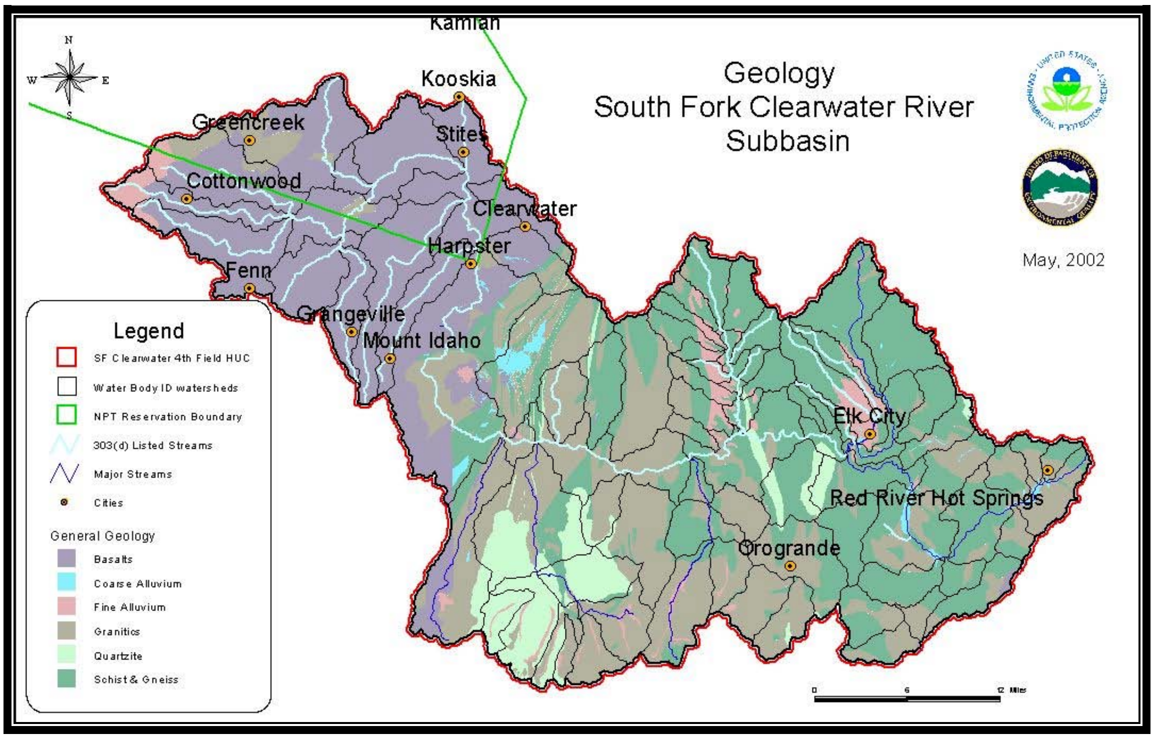

Figure 5. Geology of the SF CWR Subbasin

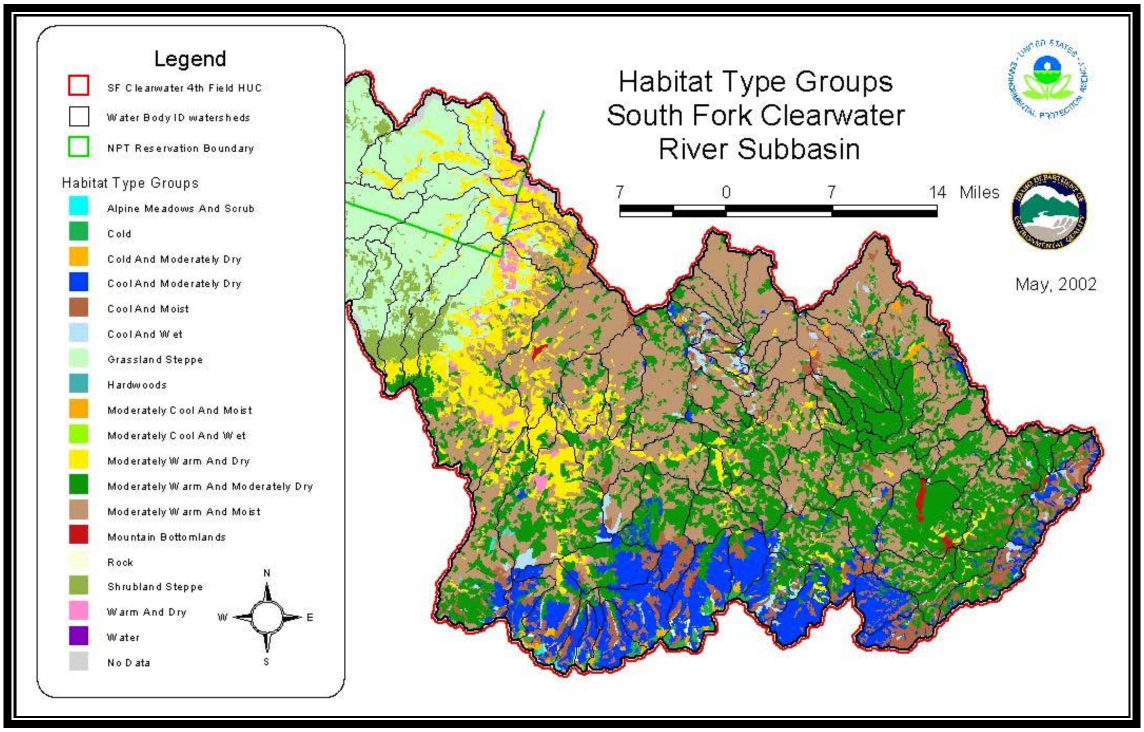

Figure 6. Habitat Type Groups of the SF CWR Subbasin

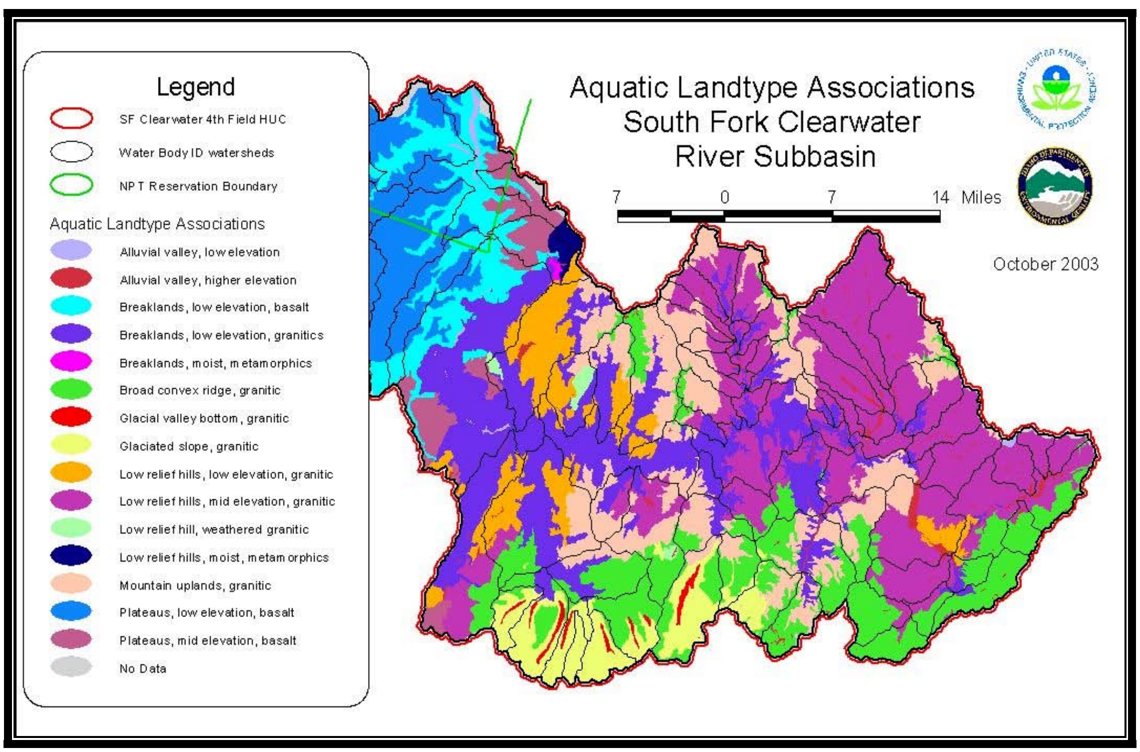

Figure 7. Aquatic Landtype Associations of the SF CWR Subbasin

Landform Group 1: Rolling Uplands-Granodiorite (ALTA 9)
This group comprises approximately 0.5% of the total analysis area, with elevations ranging from 3,800 to 5,000 feet. This LFG occurs on the upper reaches of East Fork Cougar Creek and Covert Creek and is characterized by rolling uplands derived from moderately well weathered granodiorite. The erosion hazard is very high for this material, and when it erodes, it generates mostly sand and small gravel. Sediment delivery efficiency is moderate. Surface erosional processes dominate in this LFG, but erosion is buffered by a volcanic ash-influenced soil surface layer. The slopes are moderate at 20-50%.

Cool, moderately moist habitat types are dominant. Aspect and elevation, coupled with ecological events and processes like fire, competition, herbivory, and pathogen activity are the primary influences on vegetation composition. Upland habitat types include grand fir series. Dominant overstory tree species are lodgepole pine, Douglas fir, western larch, Ponderosa pine, and grand fir. Mid and low shrubs, forbs, and grasses can dominate the understory. High water tables in sediment-filled valley bottoms favor development of meadow and meadow/shrub complexes interspersed with forest.

Landform Group 2: Rolling Uplands-Gneiss, Granite, Quartizite, and Schist (ALTAs 1,4,6, 21)
This group comprises approximately 56% of the SF CWR Subbasin, (area east of Grangeville, except along the main stem and tributary canyons and glaciated headwaters), with elevations ranging from 2,800 to 8,000 feet. It is characterized by rolling hills and convex slopes derived from moderately- to well-weathered gneiss, granite, quartzite and schist. The erosion hazard is moderate to high for these materials, which generate mostly sands and gravels. The sediment delivery efficiency is moderate. Surface erosional processes dominate in this LFG, but surface soil erosion is buffered by a volcanic ash influenced soil surface layer. The slopes are moderate at 20-50%.

Cool and cold, moderately moist habitat types are dominant. Aspect and elevation coupled with the ecological events and processes like fire, competition, herbivory, and pathogen activity are the primary influences on vegetation composition. Upland habitat types include grand fir and subalpine fir series. Dominant overstory tree species are lodgepole pine, Douglas fir, Engelmann spruce, western larch, grand fir, Ponderosa pine, and subalpine fir. Shrubs, forbs, and grasses can dominate the understory. Forest habitat types dominate streamside zones. Upland tree species often grow next to streams on well-drained adjacent hillslopes. Meadow/shrub complexes occur most extensively along Red River, American River, Elk Creek, and Meadow Creek.

Landform Group 3: Breaklands-Gneiss, Quartzite, Schist, and Granite (ALTA 3)
This LFG comprises approximately 12% of the SF CWR Subbasin (middle reaches of the SF CWR and lower reaches of Mill Creek, Johns Creek, Tenmile Creek, Crooked River, and Peasley Creek), at elevations ranging from 1,600 to 7,000 feet. This LFG is characterized by stream breaklands, mass wasted slopes, and colluvial slopes derived from moderately well-weathered granite, quartzite, gneiss, and schist. The erosion hazard is high, with these materials generating mostly sand to cobble materials. The sediment delivery efficiency is high. Surface erosion occurs on the steepest south aspects and little volcanic ash remains to

buffer against erosion. Channel scour, colluviation, and mass wasting are important landforming processes. The slopes range from 40-80%.

Habitat types vary from warm and dry to cold and moist depending on aspect and elevation. Ponderosa pine and Douglas fir series dominate lower elevations; grand fir series dominate north aspects and higher elevations. Subalpine fir is found at highest elevations. Dominant species are Ponderosa pine, Douglas fir, grand fir, western larch, lodgepole pine, subalpine fir, and Engelmann spruce. Streamside vegetation includes shrub complexes along lower elevation stream bottoms and conifer dominated communities on north aspects or higher elevations.

Landform Group 4: Glaciated Lands-Quartzite and Diorite (ALTA 2, 5)
This group comprises approximately 5% of the subbasin (upper reaches of Tenmile Creek and Johns Creek in the Gospel Hump Wilderness) with elevations ranging from 5,200 to 8,000 feet. It is characterized by steep, ice-scoured cirques and glacial troughs with inclusions of gently sloping ice scoured ridges, glacial valley bottom, and moraine deposits derived from poorly weathered Precambrian quartzite and Cretaceous quartz diorite. The erosion hazard is high, with the quartzite and quartz diorite generating sand to cobble size material. The sediment delivery efficiency is moderate to high. Sediment movement is buffered by abundant rock and locally abundant volcanic ash surface soil. Surface erosion occurs on steep slopes with shallow soils. Debris torrents, colluviation, and mass wasting are also important landforming processes. The slopes vary from 10-100%.

The vegetation is composed of cold and dry to wet grand fir and subalpine fir habitat types depending on elevation, soil depth, and aspect. Dominant species are lodgepole pine, Engelmann spruce, subalpine fir, Douglas fir, grand fir, and whitebark pine. Shrub and herbaceous communities are intermingled with forest communities in valley bottoms. Herbaceous communities are found on dry ridges.

Landform Group 5: Rolling Hills and Plateaus-Basalt (ALTA 15)
This LFG comprises approximately 1% of the SF CWR Subbasin with elevations ranging from 3,600 to 5,400 feet. It occurs primarily along headwater streams south and east of Grangeville, and is characterized by low rolling hills and plateaus of low to moderate relief, derived from moderately weathered Columbia River basalt. The erosion hazard from these materials is only slight in comparison to other geologic materials in the subbasin, generating clay to cobble size materials. The sediment delivery efficiency is low. The soils have volcanic ash surface layers, and highly aggregated subsoils with a high rock content that buffers effectively against erosion. Surface erosional processes dominate in this landform but are slight in comparison to other LFGs. The slopes are moderate, varying from 10-40%.

Warm to cool and dry to moderately moist habitat types are dominant depending on aspect, elevation, and ecological processes. Upland habitat types include Douglas fir, grand fir, and subalpine fir series. Dominant tree species are grand fir, Engelmann spruce, Douglas fir, lodgepole pine, Ponderosa pine, western larch, and subalpine fir. Mid and low shrubs, forbs, and grasses dominate the understory. Meadow/shrub complexes occur occasionally.

Landform Group 6: Steep Mountain Slopes and Stream Breaklands-Basalt and Andesite (ALTA 7)

This group comprises approximately 6% of the SF CWR Subbasin (along the SF CWR from Kooskia for 18 miles upstream and along the main canyons of Threemile Creek, Butcher Creek, and Cottonwood Creek), with elevations ranging from 1,300 to 5,200 feet. Steep mountain slopes, stream breaklands, and mass wasted slopes derived from poorly to moderately weathered Columbia River basalt ad Seven Devil volcanics characterize this LFG. The erosion hazard is slight compared to other geologic materials in the subbasin, generating mostly silts, clays, gravels, and cobbles. Sediment delivery efficiency is high. Surface erosion, colluviation, and mass wasting are important landforming processes. Little volcanic ash is present to buffer surface soils against erosion. Slopes are steep, varying from 40-80%.

Plant community composition is highly dependent on aspect and varies from very dry to moderately moist. Bunchgrass, ponderosa pine, and Douglas fir series dominate lower elevations and grand fir series dominate north aspects and higher elevations. Dominant species are Ponderosa pine, Douglas fir, grand fir, western larch, lodgepole pine, and Engelmann spruce. Streamside vegetation includes shrub and deciduous tree complexes along lower elevation stream bottoms and conifer dominated communities on north aspects or higher elevations. Extensive grazing and development have altered riparian vegetation along lower gradient reaches. Fish cover and bank stability have been reduced.

Landform Group 7: Plateaus- Basalt, Prairie (ALTA 16)

This LFG comprises approximately 20% of the SF CWR Subbasin (Camas Prairie and area south of Battle Ridge) with elevations ranging from 1,800 to 4,200 feet. This group is characterized by plateaus of low relief, derived from Columbia River basalt. The erosion hazard is only slight compared to other subbasin geology, generating mostly silt, gravel, and cobble. The sediment delivery hazard is low. Soils have mixed volcanic ash surface layers, and highly aggregated subsoils that help buffer against erosion. Slopes are gentle, varying from 5-40%.

Vegetation patterns are influenced by thin soils, low elevations, and warm dry habitat. Grasslands and open park-like stands of Ponderosa pine and Douglas fir once dominated this LFG. Upland shrub species occur with scattered trees in stream bottoms. Bunchgrass habitat types are on uplands. Existing vegetation is now primarily cropland, hay, and pasture with some remaining forestland that has been heavily impacted by grazing and timber harvest. Riparian areas were generally shrub-dominated prior to grazing and tillage impacts.

Table 3 shows the characteristics of each of the seven landform groups in the SF CWR Subbasin as related to potential sediment effects to the SF CWR and downstream areas. "Sediment Hazard from Substratum Erosion" describes the likelihood that geologic erosion would occur and that resulting sediment would be transported to a stream channel. "Mass Erosion Hazard" describes the likelihood that mass sediment delivery from lower slopes directly into a channel would occur.

Table 3. SF CWR Subbasin landform group characteristics.

Landform Group	Description	Parent Material	Sediment Hazard from Substratum Erosion	Mass Wasting Hazard
1	Rolling Uplands	Granodiorite	Very High	Low to Moderate
2	Rolling Uplands	Granite, Gneiss, Schist, Quartzite	Moderate to High	Low to Moderate
3	Breaklands	Granite, Gneiss, Schist, Quartzite	Moderate	Moderate to High
4	Glaciated Lands	Quartzite, Diorite	Low to High	Low to Moderate
5	Forested Rolling Hills and Plateaus	Basalt	Low	Low to Moderate
6	Steep Mountain Slopes and Stream Breaklands	Basalt, Andesite	Low	Moderate
7	Rolling Plateaus-Prairie	Basalt	Low	Low

Fisheries and Aquatic Fauna

The fisheries resources in the SF CWR Subbasin are thoroughly described in Appendix D. A fisheries technical advisory group (Fish TAG) was convened to develop a complete description of the fisheries resources in the SF CWR system.

Subwatershed Characteristics

The SF CWR Subbasin 303(d) listed segments are described below in the context of the subwatershed in which they are located. These were compiled from the NPNF *South Fork Clearwater River Landscape Assessment* (USFS 1998), Ecological Reporting Units. Although this discussion is limited to those subwatersheds containing 303(d) listed segments, Table 4 is included to allow comparison of the watershed condition within the SF CWR Subbasin as a whole. Channel types are described using the Rosgen (1994) classification system based on channel thread, channel entrenchment, sinuosity, bankfull width-to-depth ratio, stream gradient, and stream substrate. The primary A, B, and C channel types are broadly characterized by decreasing stream gradient and increasing sinuosity, with A channel types being characteristic of steep mountain streams, and C channel types being characteristic of meandering streams flowing across plains.

Table 4. Watershed condition indicators.

Watershed	Area (acres)	Roads (miles)	Road Density (mi/mi^2)	Timber Harvest (acres)	Timber Harvest (%)	ECA[1] (%)	Sed. Yield (%)[2]
Mill Creek	23,249	94	2.6	4,586	20	8	8
Johns Creek	72,150	60	0.5	1,198	3	<1	1
Twentymile Creek	14,545	17	0.7	153	1	1	4
Tenmile Creek	34,410	24	0.4	336	1	1	1
Crooked River	45,659	137	2.0	4,616	10	6	8
Red River	103,348	588	3.6	22,939	22	12	24
American River	58,612	213	2.3	8,129	14	10	14
Newsome Creek	42,576	220	3.3	8,010	19	7	13
Silver Creek	16,509	27	1.1	1,097	7	5	3
Peasley Creek	9,112	55	3.8	2,016	22	13	20
Cougar Creek	7,731	48	4.0	1,750	23	12	15
Meadow Creek	24,115	164	4.4	7,684	32	11	16

[1] Equivalent Clearcut Acres
[2] Sediment Yield percent over background
Source: USFS 1998

American River Watershed

The 303(d) listed water bodies in this watershed are Big Elk Creek, Little Elk Creek, Buffalo Gulch, and Lucas Lake. This watershed (58,612 acres) is almost entirely composed of mid- to upper-elevation low relief hills and alluvial valleys (ALTAs 6, 18) with some mountain uplands (ALTA 21) on the western and eastern edges. The watershed is located in Hydrologic Zone 2, characterized by mid-period snowmelt and moderate to low gradient channels.

Stream channels are predominantly low to moderate gradient B and C channel types (Rosgen 1994) with higher gradient channels in the mountain uplands. Along with the Red River, this watershed has a large amount of mid- to upper-elevation alluvial valleys (ALTA 18), and these features are spread more evenly throughout the watershed than is typical of the subbasin, where this ALTA is a linear feature along the tributary main stem. ALTA 18 is composed predominantly of C channel typess (Rosgen 1994).

The American River has been significantly affected by human activity. Historic mining occurred along significant portions of the higher order streams in the lower basin. Grazing has affected stream/riparian processes. There have been about 8,000 acres of timber harvest in the watershed (14% of the area); about 925 acres of this has been in a Riparian Habitat Conservation Area (RHCA). The RHCA's are portions of watersheds in national forests where riparian dependent resources receive primary emphasis, and federal management activities are subject to specific standards and guidelines. They include riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by: 1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams, 2) providing root strength for channel stability, 3) shading the stream, and 4) protecting water quality (USFS and BLM 1995). There are about 200 miles of existing roads in the watershed (2.3 mi/mi^2), and about 60 miles in the RHCA. Some sections of road encroach on stream/riparian processes. The NPNF considers about half this watershed to have a low level of human development. The current equivalent clearcut area (ECA) is 10%, and the current sediment yield is 14% over natural base. Big and Little Elk Creeks are part of the Elk City municipal watershed.

The overall condition for this watershed is considered low, with some subwatersheds within it in moderate condition. Stream and riparian processes have been altered principally by historic dredge mining, as well as by road encroachment and grazing. These activities have affected channel patterns, floodplain connectivity, and habitat conditions. The alteration in sediment regimes is a result of change from infrequent, large-scale disturbance events to frequent disturbances. These changes are significant in terms of aquatic processes and aquatic species, and the viability of fish populations in this watershed, including resilience to natural disturbance events, has been reduced as a consequence.

Red River Watershed

The 303(d) listed stream in this watershed is Dawson Creek. Red River is a large (103,348 acres) watershed with the largest alteration of historic sediment regimes in the SF CWR Subbasin. The lower area of the watershed is comprised of ALTA 6, mid- to upper-elevation low relief hills, with areas of ALTA 18, mid- to upper-elevation alluvial valleys. The mid-elevation subwatershed is mostly ALTA 4, low relief hills generally associated with lower elevations, along with some ALTA 18. The upper watershed is composed of ALTA 1, high elevation broad ridges. Red River is predominantly in Hydrologic Zone 2, mid-elevation rolling uplands, with the upper subdivision in Hydrologic Zone 1, high elevation mountains.

Streams in this watershed have a high frequency of B and C channel types (Rosgen 1994), and have a branched channel pattern.

Management activity in this watershed has included historic mining, roads encroaching on the stream corridors, and grazing on the main stem. About 23,000 acres of timber have been harvested (22% of the subwatershed). Approximately 5,000 acres of this harvest occurred in the RHCA. There are approximately 588 miles of existing road (3.6 mi/mi^2) in the watershed, and about 175 miles in the RHCA. There are few large areas with low levels of human development, although those areas that do exist are found in the upper basin. The current ECA for the watershed is 12% and the current sediment yield is estimated at 24% over natural base.

The overall condition for this watershed is considered low, with a portion of the upper watershed considered moderate condition. The current sediment yield is the highest percent over base for the SF CWR Subbasin, with the stream channels sensitive to these effects. As a result of management over several decades, this watershed has been subjected to one of the highest frequencies of disturbance and a reduction in habitat condition. The watershed condition has changed from patches of active disturbance and recovery, surrounded by areas of stable, high quality habitat, to homogeneously degraded habitat. The ability of aquatic species to persist as well as rebuild or repopulate areas from local stronger populations has been reduced.

Newsome Creek Watershed

The 303(d) listed water bodies in this watershed are lower Newsome Creek (Beaver Creek to SF CWR), Beaver Creek, Nugget Creek, and Sing Lee Creek. The Newsome/Leggett Creek watersheds (47,809 acres) are comprised primarily of mid- to upper-elevation low relief hills (ALTA 6), with a ring of mountain uplands (ALTA 21) on three sides. There are small patches of steep breaklands (ALTA 3) along the main stem channel. Narrow alluvial valleys (ALTA 18) are found along portions of the main stem and major tributary streams. The watersheds lie primarily in Hydrologic Zone 2.

The Newsome Creek main stem is predominantly a B3/B4 channel type (Rosgen 1994). The tributary streams have a wide range of conditions, ranging from A through E channel types with most of the lower gradient, higher quality fish habitat (B and C channel types) occurring in conjunction with ALTAs 18 and 6.

The Newsome Creek area has had a considerable amount of management activity. Most of the main stem channels and some tributaries had historic mining that affected stream and riparian processes. Additionally, a road parallels the main stem, encroaching on the riparian area and stream floodplain. Approximately 8,000 acres have been harvested for timber (19% of the area) with about 1,300 of these acres in the RHCA. The current ECA for Newsome Creek is 7%. There are approximately 220 miles of existing road in the Newsome Creek watershed (3.3 mi/mi^2); 55 miles in the RHCA. About one third of the watershed is considered to have a low level of human development by the NPNF. Current sediment yield is estimated at13% over natural base.

The Newsome Creek watershed condition is considered to be low quality by the NPNF. Stream/riparian processes have been altered by historic mining and road impacts. Sediment yields have been influenced from an infrequent disturbance regime changing to a frequent disturbance regime. Connectivity with the SF CWR main stem (the movement of aquatic species up or downstream) has also been reduced by unsuitable habitat conditions.

Cougar Creek Watershed

Cougar Creek is considered water quality limited (303(d) listed) from its headwaters to the confluence with the SF CWR. The watershed (7,731 acres) is composed predominantly of ALTAs 3 and 4, with some ALTA 21 in the upper end. It is located primarily in Hydrologic Zone 3. The main stem is predominantly B channel, with higher gradient A channels in tributaries.

Approximately 2,309 acres of timber have been harvested (29% of the watershed). There are 48 miles of existing roads, with a watershed road density of 5.1 mi/mi^2. The current ECA is 12%, and sediment yields are estimated at 15% over natural base levels.

The Cougar Creek watershed is considered to be low quality by the NPNF. Accelerated sediment yields have led to a reduction in aquatic habitat diversity and a deteriorated condition.

South Fork Clearwater River Canyon

The SF CWR is considered water quality limited (303(d) listed) from its headwaters at the confluence of Red River and American River to the mouth at Kooskia. The South Fork Canyon watershed (90,058 acres) includes the main stem South Fork River and the face drainage tributaries. This area is primarily ALTA 3, low elevation breaklands, with upper portions of the canyon considered ALTA 6. The canyon is in Hydrologic Zone 3. Most of the land area below the NPNF boundary is assigned to the Camas Prairie Watershed for descriptive purposes.

Historic mining has affected portions of the main stem and some tributaries, primarily in upper river areas. Timber harvest has occurred on 19,545 acres (22% of the area) with about 3,300 acres in the RHCA. The majority of timber harvests occurred between 1960 and 1990, mainly as clearcuts. There are approximately 487 miles of existing roads, with about 160 miles located in the RHCA. Many roads, including the highway along the river, encroach on stream/riparian processes. About one third of the area is considered to have a low level of human development. Management activity has also affected the sediment regime, although the precise effects on the main stem are unknown.

The lower reaches of the SF CWR have been affected to various degrees by aggradation, channelization, diking, riparian vegetation removal, and encroachment by roads and buildings. Aggradation of the river is associated with bedload from upstream sources, most noticeably from the major Camas Prairie tributaries (Butcher Creek, Threemile Creek, and Cottonwood Creek), and localized bank erosion. In the unconfined reaches of the South Fork, this has resulted in a wider, shallower channel with fewer large pools. Fish habitat has been affected by less cover, fewer deep holding areas, elevated sediment yields, and warmer summer water temperatures. These conditions have resulted in reduced connectivity and rearing capability.

Camas Prairie Watersheds

The 303(d) listed water bodies on the Camas Prairie are Cottonwood Creek, Threemile Creek, and Butcher Creek. This area of the SF CWR Subbasin (199,000 acres) includes the basalt plateau and the steep canyons at lower elevations along the large streams and SF CWR. Most of the area to the west of the NPNF boundary was assigned to these watersheds. Cottonwood, Grangeville, Harpster, Kooskia, Stites, and Clearwater are centers of residential development. This SBA will focus on Threemile Creek and Butcher Creek subwatersheds. The Cottonwood Creek TMDL was completed in 2000 by DEQ, USEPA, and the NPT.

The Camas Prairie watersheds are comprised of silt-loam soils overlying the Mafic (99%) and Calc-Alkaline (1%) volcanic flows. The Brody-Wapshilla association and the Telcher-Suloaf silt loams dominate the mountain soils. The Nez Perce, Ferdinand, and Shebang silt loams are the dominant soil series on the plateau. The Klickson-Suloaf complex is the dominant soil series on the canyon side slopes, and the Typic Xerofluvents comprise the flood plains and stream channels (Barker 1982).

The Camas prairie streams are among the most heavily impacted in the subbasin. Most streams on agricultural land have been modified by riparian tree and shrub removal, field plowing, and channelization. This has resulted in channel erosion, channel destabilization, and sediment deposition. Livestock feedlots and season-long grazing have impacted certain reaches. As the streams flow from the prairie via breaklands to the main stem SF CWR, erosion of channels is common due to steeper gradients and altered upstream conditions. As these streams reach the SF CWR valley floor, their gradients drop considerably, causing deposition of bedload sediment. This has resulted in aggraded channels. Impacts of the increased sediment yields to tributary channels include wider, shallower channels, loss of pools, loss of riparian shading, and warmer summer water temperatures.

Threemile Creek originates in forested headwaters (5,000 feet elevation), four miles south of Grangeville and flows approximately 16 miles to its confluence with the SF CWR at river mile 7.6. The watershed is approximately 24,966 acres in size and 99% privately owned (less than 0.5% owned by the Bureau of Land Management (BLM 1999). The lower 5 miles flow through the NPT Reservation.

The upper reaches of Threemile Creek flow through dryland farming and livestock grazing areas. As the stream passes through the city of Grangeville it is impacted by storm water runoff, domestic livestock grazing, and the Grangeville waste water treatment plant (WWTP). Additional dryland farms are situated along the stream for approximately 4 miles north of Grangeville before it flows through a steep canyon for approximately 8 miles and into the SF CWR. The Threemile Creek drainage is in poor condition due to agricultural activities, riparian degradation from grazing, and sewage effluent. Logging and roads in the canyon reaches have also resulted in localized adverse effects to the stream (BLM 1999).

Butcher Creek originates 1 mile south of Mt. Idaho in forested headwaters (5,000 feet elevation) and flows 11.9 miles to its confluence with the SF CWR at river mile 11.7. The watershed is approximately 11,203 acres, and is 98% privately owned, 2% state-owned, and less than 0.001% BLM-owned (BLM 1999). The lower 1.8 miles of Butcher Creek flow within the NPT Reservation boundary.

The headwater area consists of moderately sloped rolling hills with agriculture and wood lot areas. During the past years the number of residences and ranchettes has increased in the headwater areas. The stream flows through a moderately steep canyon from the town of Mt. Idaho to the mouth. Cattle grazing occurs over the entire length of the creek, but predominantly in the extreme upper and lower reaches (Fuller et al. 1985). Fuller et al. (1985) found sparse riparian vegetation at the two extremes but dense vegetation in the canyon proper. High annual runoff was evident and indications of past flooding were identified in the lower reaches. Logging has occurred in the past throughout the drainage.

Stream Characteristics

Stream characteristics for the 303(d) listed segments discussed below are compiled from the *South Fork Clearwater River Biological Assessment* (USFS 1999). Ratings for habitat parameters refer to *the Matrix of Pathways and Indictors of Watershed Condition for Chinook, Steelhead, and Bull Trout- Local adaptation for the Clearwater Basin and Lower Salmon* (NMFS et al. 1998). This matrix is used by federal land management agencies to describe watershed conditions as high, moderate, or low condition for endangered species consultation. Stream and watershed parameters (temperature, cobble embeddedness, road density, etc.) are evaluated using quantitative and qualitative indicators.

American River Watershed

The 303(d) listed segments/water bodies occurring within American River watershed include: Buffalo Gulch, Big Elk Creek, Little Elk Creek, and Lucas Lake.

Buffalo Gulch
Buffalo Gulch flows into the American River at river mile 0.7, and provides habitat for steelhead, westslope cutthroat trout, brook trout, and sculpin. Spring chinook salmon may use the stream for rearing; however, such use has not been documented. The lower reaches of the creek have been dredge mined; and roads, logging, and grazing have impacted the stream. Monitoring by the BLM measured 65% cobble embeddedness and spawning gravels had 48% fine sediment less than 6.3 mm (BLM 1995a). Rosgen (1994) B type channels dominate in the lower reaches, while A channel types (Rosgen 1994) dominate the upper reaches (BLM 1995a). The average gradients ranged from 2-9%, and unstable stream banks ranged from 2-30%. Limiting habitat factors include high levels of deposited sediment, high summer water temperatures, and a lack of good quality pools (USFS 1999).

Big Elk Creek
Big Elk Creek provides habitat for steelhead, spring chinook, salmon, westslope cutthroat trout, brook trout, mountain whitefish, sculpin, and dace. Bull trout may use Big Elk Creek for adult and subadult rearing; however, an Idaho Department of Fish and Game (IDFG) survey in 1998 did not document the presence of bull trout. The lower reaches meander through a broad meadow, while the middle reaches flow through stringer meadows and forested stream bottoms. Grazing is light in the stream bottoms and moderate in the meadow areas. Land use impacts include grazing, roads, and logging. Cobble embeddedness was 52%, and spawning gravels had 40% fines less than 6.3 mm (USFS 1999). A 1991 BLM survey identified C channels as dominant in the lower reaches, and B channel types (Rosgen 1994) in the upper reaches. Average gradient ranged from 1-3 %, and unstable stream banks varied from 2-10%. The seven-day running average maximum temperature during steelhead and cutthroat trout spawning periods was 11.5 ^{o}C (52.7 ^{o}F) (rated high quality). The seven-day running average maximum temperature for the bull trout spawning interval was 13.4 ^{o}C (56.1 ^{o}F) (rated low quality). Primary limiting habitat factors include high levels of

deposited sediment, high summer water temperatures, and lack of good quality pools. Water temperatures are cooler in upstream reaches (USFS 1999).

Little Elk Creek

Little Elk Creek provides habitat for steelhead, spring chinook salmon, westslope cutthroat trout, brook trout, mountain whitefish, sculpin, and dace. Bull trout may use Little Elk Creek for adult and subadult rearing; however, an IDFG survey in 1998 did not document the presence of bull trout (USFS 1999). The upper reaches flow through stringer meadows and forested stream bottoms, while the lower reaches meander through a broad meadow. Grazing is light in the stream bottoms and moderate in the meadow areas. Land use impacts include grazing, mining, roads, and logging. BLM monitoring in 1986 showed cobble embeddedness to be 56% (rated low condition), while spawning gravels had 37% fines less than 6.3 mm surveyed (rated low condition) (USFS 1999). A BLM survey conducted in 1992 (USFS 1999) identified C channel types as dominant in the lower reaches, and B channel types (Rosgen 1994) in the upper reaches. The average gradient ranged from 1-2 %, and unstable stream banks varied from 10-25% in the lower reaches downstream from the NPNF boundary. The seven-day running average maximum temperature during steelhead and cutthroat trout spawning periods was 14.1 ^{o}C (57.4 ^{o}F) at stream mile 0.01 and 10.6 ^{o}C (51.1 ^{o}F) at stream mile 4.2. The seven-day running average maximum temperature for the bull trout spawning interval was 19.6 ^{o}C (67.3 ^{o}F) at stream mile 0.01 (rated low condition) and 15.2 ^{o}C (59.4 ^{o}F) at stream mile 4.2 (rated low condition). Primary limiting habitat factors include high levels of deposited sediment, high summer water temperatures, and lack of good quality pools. Water temperatures are cooler in upstream reaches.

Lucas Lake

Lucas Lake is currently listed on Idaho's 303(d) list for sediment pollution. It is a sink or depression that may be an old "glory hole," (pit left by hydraulic mining) or it may be a natural feature. Lucas Lake has steep underwater banks, and appears to maintain full pool conditions throughout the year. The lake is surrounded by a very small, steep, contributing watershed composed of small-grained sedimentary deposits. Many raw outcroppings of this erosive sedimentary rock are visible. The riparian area appears healthy. There is a distinct blue-green color to the water, probably colloidal in nature, which may have been mistaken for toxic substances in past assessments. Abundant water boatman (*Hemiptera corixidae*) and backswimmer (*Hemiptera notonectidae*) aquatic insects were observed, and there have been reports of fish (Appendix N).

Riparian Characteristics of the American River Watershed

The riparian vegetation includes grand fir/arrowleaf groundsel, subalpine fir/twisted stalk, subalpine fir/bluejoint, sedge meadows, shrub/sedge complexes, and riparian shrubs (e.g. willow, alders etc.). Many of the low gradient reaches in the Elk City township have been dredge mined and lack grass/sedge meadow vegetation. The shrub component is lacking or reduced due to browsing by domestic animals and wildlife and the mining impacts.

Red River Watershed

Dawson Creek discussed below is the only 303 (d) listed water body in the Red River Watershed.

Dawson Creek
Dawson Creek provides habitat for steelhead, spring chinook salmon, and westslope cutthroat trout. Bull trout presence is not documented (DEQ 1998). The NPNF classifies the Red River watershed as a stronghold for these four fish species. Reconnaissance-level surveys conducted of the lower reach (DEQ 1995, BLM 2001) identified a B type channel with a gradient of 1-2 %. The dominant substrate particle size was small gravel while the subdominant substrate was sand/silt size. The average width was 2-4 feet and the average depth 0.3 feet. Stream bank stability was rated 95-100% for the reaches surveyed. Percent surface fines ranged 15-25% (BLM 2001) to 49% (DEQ 1995). Cobble embeddedness was rated 40-50% (BLM 2001). The instantaneous temperature was 13ºC, and discharge ranged from 0.3 cfs (BLM 2001) to 0.6 cfs (DEQ 1995). The BLM survey noted the presence of 6-inch trout and spotted frogs. Land use observed at the time included livestock grazing (horses), timber harvest, roads, and a private residence. Localized logging was noted along the stream/riparian area on private lands.

Common Riparian Vegetation of the Dawson Creek Watershed
Common riparian vegetation includes alder, Carex sp., western yarrow, grand fir, menziesia (fool's huckleberry), and arrowleaf groundsel (BLM 2001).

Newsome Creek Watershed

The Newsome Creek watershed provides habitat for steelhead, spring chinook salmon, westslope cutthroat trout, bull trout, and several other species including long nose dace, suckers, sculpin, and whitefish. The four 303(d) listed water bodies include: Newsome Creek (Beaver Creek to SF CWR), Beaver Creek, Nugget Creek, and Sing Lee Creek.

Newsome Creek
Newsome Creek width-to-depth ratios rate high condition for B and C channel types (Rosgen 1994) and low condition for A channels. The first mile upstream from the mouth (B channel) rates as low condition due to a very high width-to-depth ratio. Some channel reaches have been altered by dredge mining. Stream bank stability is rated low condition for main stem Newsome Creek. Floodplain connectivity is rated low condition due to extensive dredging and road encroachment.

Cobble embeddedness exceeded 30% (low condition) throughout all measured reaches in the watershed, and ranged from 34-94% (USFS 1999). Percent surface fines rated low condition, with 18% fines for riffles and 31% for pools (USFS 1999). Fines by depth rated low condition (36%) as measured by McNeil core sampling in 1984. The acting woody debris is rated low condition, ranging from 0-5 pieces per 100 meters. The pool frequency is rated low condition with no reaches meeting pool frequency standards, but the pool quality is rated high in the main stem from habitat improvement structures (USFS 1999).

Temperatures rated low condition for steelhead and bull trout, exceeding 18ºC in surveys conducted in 1995 and 1996 (USFS 1999).

Beaver Creek
Surveys conducted of Beaver Creek, one reach BURP (DEQ 1995), and two reaches NPNF (USFS 1996b) identified predominantly B channel type (Rosgen 1994) with a gradient ranging from 3-7 %. The average wetted width was 2.7 meters and the average wetted depth was 0.2 meters. Stream bank stability was rated 70-100% for the reaches surveyed. Percent surface fines were 46% (DEQ 1995). Cobble embeddedness was rated at 50-75% (DEQ 1995). Instantaneous temperatures were 10ºC and 12ºC, and discharge was 6.7 cfs (DEQ 1995).

Nugget Creek
Two surveys conducted of Nugget Creek (DEQ 1995, USFS 1996b) identified predominantly B channel type (Rosgen 1994) with a gradient of 3.3-3.5%. The average wetted width was 2.13 meters and the average wetted depth was 0.05 meters. Stream bank stability was rated 99-100% for the reaches surveyed. Percent surface fines were 35% (DEQ 1995). Cobble embeddedness was rated 48% (USFS 1996b). The instantaneous temperature was 11ºC (USFS 1996b) and discharge was 1.0 cfs (DEQ 1995).

Sing Lee Creek
The survey conducted of lower Sing Lee Creek (DEQ 1995) identified predominantly B channel types (Rosgen 1994) with a gradient of 3.5%. The average wetted width was 1.6 meters and the average wetted depth was 0.04 meters. Stream bank stability was rated 90% for the reach surveyed. Percent surface fines were 50%. Discharge was 1.8 cfs.

Riparian Characteristics of the Newsome Creek Watershed
Streamside vegetation includes grand fir/arrow leaf groundsel, subalpine fir/twisted stalk, subalpine fir/bluejoint, sedge meadows, and shrub/sedge complexes.

Cougar Creek Watershed

Cougar Creek is 303(d) listed as impaired by sediment. Its stream characteristics are discussed below.

Cougar Creek
The bottom substrate of Cougar Creek consists mainly of boulders and bedrock. The main stem is predominantly a B-1 channel, with short sections of B-2 and C-2 channel types (Rosgen 1994). Stream gradients average 4-5% although a few reaches vary between 7-8%. Cobble embeddedness estimates are high and are thought to be limiting fish production. Cobble embeddedness averaged 65% in 1989 surveys (USFS 1999) and 58% and 64% at two locations in 1996 surveys (USFS 1999). There are very low levels of acting and potential large woody debris. Pool frequency is rated low. Pools per mile ranged from 46.7 to 91.9 in 1989 surveys. Flood plain connectivity is considered low due to roads paralleling the stream. Stream bank stability is moderate, with B channel types rated 94-95% stable. The stream bankfull width-to-depth ratio is considered low condition. Thermographs in the summer of

1996 recorded a high of 19.8 ^{o}C (67.6 ^{o}F) and a daily average of 17.6 ^{o}C (63.7 ^{o}F) (USFS 1999).

Riparian Vegetation Characteristics of the Cougar Creek Watershed
The riparian condition is rated as moderate due to poor bank cover in lower reaches. Upper reaches have relatively good bank cover. Livestock grazing has also degraded riparian and stream bank conditions.

South Fork Clearwater River Canyon

Chinook salmon, steelhead, westslope cutthroat trout, and bull trout are present in the main stem of the SF CWR. The face drainages currently are rated low condition for road density and streamside road density. There are an average of 3.51 miles of roads per square mile of watershed, and an average streamside road density of 4.36 miles per square mile. Landslide prone road density is considered moderate at 1.1 miles per square mile throughout the face drainages. Potential changes in peak/base flow and water yield rate as low condition. The average ECA for the face drainages (9.6%) suggests that there should not be significant effects on peak/base flow related to fires or logging. However the moderately high ECA values in some watersheds (15-30%) and extremely high ECA values in Nelson Creek (48.2%) and Earthquake Creek (36.1%) may be causing localized impacts in individual watersheds and on the main stem SF CWR (USFS 1999).

Sediment yield from the face drainages and SF CWR main stem is currently 9% over base, rating as moderate condition. Stream bank stability of the main stem is rated high condition due to armoring along Highway 14. The opposite bank is primarily composed of bedrock and large boulders. Suspended sediment levels are fairly low, rating high condition for habitat. Main stem suspended sediment averages exceeded 25 milligrams per liter (mg/L) for 8 days and 80 mg/L for one day during years 1988-1992 (USFS 1999).

The main stem SF CWR begins at the confluence of the American River and the Red River. From this point to about Tenmile Creek, the river is relatively low-gradient (C channel) riffle/pool habitat dominated by gravel and cobble substrate. The channel has been altered by dredge mining and the placement of State Highway 14. From Tenmile Creek to Mill Creek, the river becomes steeper and more confined with the substrate dominated by boulders and cobbles. The channel type is typically A, B, or G (Rosgen 1994). This is a high-energy reach through which the sediment is readily transported. From Mill Creek to just above Threemile Creek, the river alternates between relatively flat, unconfined reaches and steep, narrow, confined reaches. The Rosgen (1994) channel type varies widely (A, B, C, or G). The river also changes direction near the forest boundary and begins to flow nearly due north. From Butcher Creek to its confluence with the Clearwater River at Kooskia, the SF CWR is a relatively flat, unconfined, C channel, dominated by riffle/pool habitat with gravel and cobble substrate. This lowest reach of the river has been partially confined by dikes in the vicinity of Stites and Kooskia.

Cobble embeddedness (40%) is rated low condition for the upper SF CWR. Percent surface fines were 12% in the upper SF CWR and were rated moderate condition. Percent fines by depth for spawning gravels are rated poor condition for the upper SF CWR and 40% were less than 6.3 mm (USFS 1999).

Temperature is rated low condition for bull trout and steelhead spawning, rearing, and migration. The highest mean weekly temperature was 26.6 ^{o}C (80.0 ^{o}F) at Mount Idaho, and temperatures exceeded 15.5 ^{o}C (59.9 ^{o}F) during the steelhead spawning interval (USFS 1999).

Generally temperatures in the SF CWR main stem are too warm for native fish and temperatures increase after the river leaves the NPNF. Several factors contribute to this temperature increase including stream aspect (north-south), elevation, warmer ambient air temperature, and a high width-to-depth ratio. Data collected in the SF CWR between 1991 and 1993 by the NPNF, BLM, and USGS (USFS 1999) show temperatures exceeding levels conducive to chinook, steelhead/rainbow, cutthroat, and bull trout optimal growth, migration, and survival (Table 5).

Table 5. SF CWR temperatures, 1991-1993 (USFS 1999).

Site	Year	Days >20 ºC (68 ^{o}F)	Maximum Temperature
Mt. Idaho	1991	44 (24 consecutive days)	24.1 ^{o}C (75.4 ^{o}F)
Mt. Idaho	1992	14 (9 consecutive days)	22.3 ^{o}C (72.1 ^{o}F)
Stites	1992	34	27.1 ^{o}C (80.8 ^{o}F)
Mt. Idaho	1993	0	19.0 ^{o}C (66.2 ^{o}F)
Stites	1993	32	22.6 ^{o}C (72.7 ^{o}F)

Data collected by the BLM just upstream of the Crooked River Bridge (approximately 27 miles upstream from the Mt. Idaho Bridge) suggest that the temperatures recorded at the Mt. Idaho site are indicative of those found throughout the upper SF CWR basin (USFS 1999).

Water Temperature Conditions Summarized in 1999 NPNF Biological Assessment (USFS 1999):

1. Summer maximum water temperatures in the upper reaches of the main stem are probably significantly elevated above natural, since the river there is primarily composed of inflows from impacted tributaries such as the American River, Red River, Newsome Creek, and Crooked River.

2. The main stem may become relatively cooler as it flows through the steep narrow reaches from Golden Canyon to the Mt. Idaho Bridge as a result of topographic shading and inflow from large cool tributaries such as Tenmile Creek and Johns Creek.

3. Below the NPNF boundary, the main stem warms considerably for the reasons discussed above.

Riparian Characteristics of SF CWR Main Stem
Riparian vegetation has been severely reduced for the entire length of the main stem by State Highway 14. Invasions of knapweed have occurred along both banks. Herbicides are routinely applied by the Idaho Transportation Department (ITD). A number of different compounds have been approved for use in the SF CWR watershed including Amine 4, Garlon 3A, Karmex DF, Oust XP, Transline, and Krovar I (Funkenhouser 2002). These products are applied according to the manufacturer's recommendations, and if applied correctly are acceptable for use near water bodies.

Floodplain connectivity is rated low condition. The location of the highway has led to a reduction in riparian and wetland areas and a significant change in riparian vegetation/succession.

Camas Prairie

Threemile Creek and Butcher Creek headwater areas have gravel and cobble substrate. As the streams flow through upper prairie areas, the channel types (Rosgen 1994) are typically B and the dominant substrate changes to silt and sand. These streams become steeper and their valleys more confined as they cut into low elevation breaklands, with the substrate changing to predominantly gravel and cobble. Significant amounts of bedload from these streams are delivered to the lower main stem SF CWR, as evidenced by the accumulation of alluvial fans at their mouths. These systems respond quickly to midwinter snowmelt and rain-on-snow events, frequently resulting in localized flooding.

Threemile Creek
Threemile Creek provides spawning and juvenile rearing habitat for steelhead trout, and historically chinook salmon. Surveys conducted in 1982 collected 6 young of the year (YOY) rainbow/steelhead and one YOY chinook salmon at stream mile 0.8. (Kucera et al. 1983). Adult steelhead have been observed during the past in the segment of the creek flowing through Grangeville (BLM 1999). Bull trout use of this creek has not been documented. Spring/summer chinook salmon use the creek for rearing (Kucera et al. 1983); however, spring chinook salmon use of the creek is at very low levels. A 1996 flood event resulted in severe channel and stream bank scouring. Previous flood events have also resulted in severe channel scouring. Large woody debris is lacking in-stream. The primary limiting factors for fish production include low flows, high summer water temperatures, poor riffle/ pool ratios, lack of good quality pools, and lack of in-stream cover (BLM 1999). Kucera et al.'s (1983) survey found cobble embeddedness ranged from 40-60%, with substrates ranging from small rubble and loose gravels to small boulder at the three stations.

Butcher Creek
Butcher Creek provides spawning and juvenile rearing habitat for steelhead. Spring/summer chinook salmon use Butcher Creek for rearing; however, such use is at very low levels. Bull trout use of this creek has not been documented. In 1982 rainbow/steelhead trout and young of the year spring/summer chinook salmon were sampled in Butcher Creek (Kucera et al. 1983). Recent electrofishing conducted by the NPT, June 27, 2002, documented 7 age one rainbow/steelhead and 3 juveniles (NPT 2002b). The primary limiting factors for fish

production include low summer stream flow, high summer water temperatures, extreme variations in stream flow, and lack of in-stream cover (BLM 1999). Kucera et al.'s (1983) survey found cobble embeddedness ranged from 25-60%, with substrates varying from small to large rubble at the three stations.

Vegetation Characteristics of Lower SF CWR Tributaries
Plant community composition is dependent of aspect, elevation, and soils. Habitat types vary from warm and dry (15 inches precipitation) to cool and moist (30 inches of precipitation). Common vegetation types include conifer, Palouse/canyon grasslands, and agriculture (dry farming–wheat, barley). The Palouse/canyon grasslands vegetation includes bluebunch wheatgrass, Idaho fescue, arrowleaf balsamroot, cheat grass, and shrubs/trees associated with some aspects. Good examples of relic Palouse grasslands are very rare, as agricultural activity and livestock grazing have altered these habitats significantly. Canyon grasslands in poor ecological condition generally are heavily infested with noxious weeds; yellow star thistle is the most common weed infesting range lands in the area. Common timber types include Douglas fir and ponderosa pine; grand fir occurs at higher elevations and areas with higher moisture regimes (BLM 1999)

1.3 Cultural Characteristics

Land ownership, land use, and cultural aspects of the SF CWR Watershed are discussed below.

Land Ownership

The SF CWR Subbasin includes a mixture of private and public lands covering approximately 752,000 acres (Figure 8). Table 6 lists the acreage of the major management groups. The Camas Prairie portion of the watershed contains approximately 199,000 acres and is comprised of private, BLM, state of Idaho, and NPT ownership.

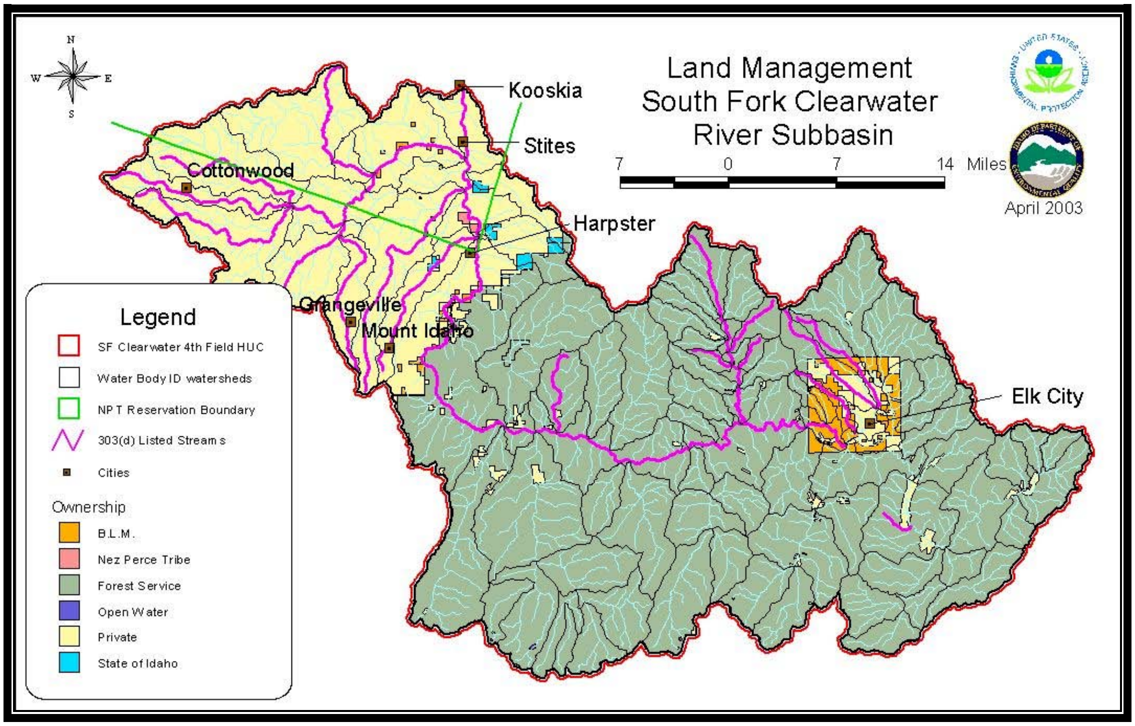

Figure 8. Major Land Managers of the SF CWR Subbasin

Table 6. Acreages of the SF CWR Subbasin land management groups.

Land Ownership/Management Agency	Acres	Percent
Nez Perce National Forest	516,262	68
Bureau of Land Management	14,906	2
Private	218,316	29
Nez Perce Tribe	564	<1
Idaho State Department of Lands	3,330	<1

Nez Perce Tribe Treaty Rights

Members of the Nez Perce Tribe have used and occupied the SF CWR Subbasin and surrounding area since time immemorial. Prior to the Treaty of 1855, the Nez Perce had exclusive use and occupancy over an area of approximately 13 million acres in central Idaho, northeastern Oregon, and southeastern Washington. Nez Perce members have and continue to use much of this territory, including the SF CWR Subbasin for hunting, fishing, gathering, and pasturing.

By virtue of the Treaties of 1855 and 1863, the Nez Perce Tribe reserved to itself certain rights, which are described in the treaties referenced below.

Treaty with the Nez Perce of 1855, Article 3: "The exclusive right of taking fish in all streams where running through or bordering said Reservation is further secured to said

Indians; as also the right of taking fish in all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land."

Treaty with the Nez Perce of 1863, Article 8: "The United States also agrees to reserve all springs or fountains not adjacent to, or directly connected with, the streams or rivers within the lands hereby relinquished, and to keep back from settlement or entry so much of the surrounding land as may be necessary to prevent the said springs or fountains being enclosed; and, further, to preserve a perpetual right of way to and from the same, as watering places, for the use in common of both whites and Indians."

Communities

The largest town in the SF CWR Subbasin and the Idaho County seat is Grangeville (population 3,208). Other towns in the watershed include Kooskia (population 708), Cottonwood (population 852), Stites (population 215), Elk City (population 670), Mt. Idaho (population 75), Greencreek (population 50), Clearwater (population 35), Orogrande (population 10), Harpster, Big Butte, and Golden.

The current population estimate for Idaho County is 15,311. As the population of the Idaho County towns (Table 7) is only 5,693, approximately 10,000 residents live in rural areas. Growth trends in north-central Idaho show rural areas experiencing an influx of new residents. An analysis for Clearwater Economic Development Association (USFS 1998) showed nine communities with populations less than 1,000 growing in excess of 4% per year since 1991. In addition, unincorporated areas in Idaho County are attracting a greater share of new residents and exceeding city population growth. Many of the people locating in the rural areas are self-employed or retirees. Retirees tend to spend more of their income locally than other groups, and individuals who are self employed are not competing for jobs that others can fill. Table 7 shows population trends in Idaho County.

Table 7. Population trends in Idaho County.

Location	1970	1980	1990	1992
Cottonwood	867	941	822	852
Ferdinand	157	144	135	141
Grangeville	3636	3666	3226	3208
Kooskia	809	784	692	708
Riggins	533	527	443	460
Stites	263	253	220	215
White Bird	185	154	108	109

History and Economics

The SF CWR was once a major producer of steelhead and spring chinook salmon. The main stem and almost all tributaries with adequate access and discharge supported spawning and rearing for steelhead. Cutthroat and bull trout populations are also believed to have thrived throughout the subbasin. The lower SF CWR may have supported runs of coho and fall chinook salmon. The productivity of the subbasin is believed to have been historically higher as a function of nutrient supplementation from the Pacific Ocean when large numbers of anadromous salmonids provided nutrients both in the form of thousands of decaying carcasses from returning adults and the millions of eggs laid annually. In addition, the rearing juveniles provided a large prey base for resident salmonids.

The decline of the fishery and habitat in the SF CWR Subbasin probably began in 1861 when gold was discovered in the basin. Early mining, along with the associated grazing and timber harvest, is likely to have created only localized degradation. The decline accelerated in 1900 when large-scale hydraulic and dredge mining began. Road construction, primarily to access mining claims, also increased. A lull in large-scale mining occurred between about 1910 and 1930. In 1930, large-scale mining projects resumed and continued through the late 1950s. Newsome Creek, American River, Red River, and Crooked River were among the most heavily impacted. Between 40 and 50 miles of prime spawning and rearing habitat were drastically altered and heavily degraded by dredge mining, and large amounts of sediment were released into the tributaries and the SF CWR main stem.

As hydraulic and dredge mining activity declined, commercial timber harvest and road construction activity increased, most dramatically during the 1960s. This increase created another large, sustained peak in sediment levels. Harvest units typically did not have riparian buffers, and roads were poorly constructed. Streams were frequently straightened to accommodate roads, and the reconstruction of the South Fork Highway (Highway 14) resulted in constriction, steepening of the channel, and direct sediment delivery.

Grazing probably peaked in the 1920s and currently occurs at a lower level. Grazing impacts have been most severe in some of the important anadromous spawning and rearing areas in the Red River, American River, and Meadow Creek. Grazing has also impacted a number of smaller tributaries and has had severe impacts in many of the lower mainstem tributaries as well.

In 1911, a dam was constructed on the lower SF CWR main stem below the NPNF boundary near Harpster, near river mile 22 (upstream from the mouth), to provide power to the city of Grangeville. A fish ladder was installed in 1935 and remained until 1949, when it was destroyed by high water. Thus, the dam was a complete barrier to fish migration, and anadromous salmonids (chinook, coho, steelhead) and Pacific lamprey were excluded from the upper watershed from 1911 to 1935, and from 1949 until 1963, when the dam was removed. A second dam was constructed on the Clearwater River main stem near Lewiston in 1927 and was removed in 1974. This dam's fish ladder was remodeled around 1939 because the original ladder functioned poorly. Even though run sizes were sharply reduced, some passage of anadromous fish is believed to have occurred during 1927-1939. Two potential fish barriers on the SF CWR include the Kooskia Flower Mill Dam and the Dewey Mine Dam. Fish passage conditions from these dams are not fully known, but they don't appear to have been complete migration barriers (N. Gerhardt 2002d). These two dams no longer exist. Construction of downstream dams on the main stem of the Snake and Columbia Rivers has also contributed to the decline of anadromous fisheries in the SF CWR Subbasin.

The exclusion of anadromous salmonids from the upper watershed caused a major decrease in the availability of forage fish for cutthroat and bull trout. This decrease coupled with habitat degradation is believed to have caused sharp reductions in cutthroat and bull trout populations beginning in the 1930s. Increased fishing pressure following completion of a road adjacent to the SF CWR in 1932 may have also contributed to the decline (Appendix D).

Anadromous salmonids returned to the upper SF CWR watershed through a combination of natural straying and reintroduction efforts after the Harpster dam was removed. However, by this time, prime spawning and rearing areas were heavily degraded. Populations of anadromous and resident fish have never recovered, and current population levels represent only a small percentage of their original levels. Even in the current degraded condition, under-utilized spawning and rearing habitat is available in the watershed. Thus the potential remains for the SF CWR to play a significant role in the recovery of anadromous salmonids if escapement at downstream dams can be improved.

Land Use

Primary land uses and economic interests within the subbasin include timber harvesting, mining, grazing, outfitting and guiding, recreation, and agriculture.

Timber Harvest

Timber harvest was associated with early mining activity between 1860 and 1910, and with homesteading from 1910-1920. In 1863, a sawmill was built in the vicinity of Elk City. By the turn of the century, as many as seven sawmills were producing lumber in the Elk City mining district. Commercial timber harvest began in the 1940s. During the 1940s and the 1950s, the rate of timber harvest was relatively low. The sawlog timber volumes sold in the subbasin since 1971 are shown in Table 8. The volume peaked in 1972 at 83.4 million board feet (MMBF). The lowest level was in 1992 with a figure of 0.3 MMBF.

In 1958, the Shearer Lumber Products sawmill near Elk City opened. This mill, as well as other mills which opened about the same time, created a large demand for timber. As a result the rate of harvest increased during the 1960s and 1970s. Clearcutting was the dominant silvicultural system used. Since the 1980s, the rate of timber harvest has been decreasing, as well as the amount of clearcutting.

In 1974, the state of Idaho adopted the Forest Practices Act (FPA), which oversees forest practices. Inspections are made by the state to ensure compliance with these rules and regulations. From 1991 to 1993, the number of harvest activities on private land increased from 107 to 234. The size of individual harvests is also increasing.

Table 8. Sawlog volume sold from SF CWR Subbasin.

5 Year Intervals	Total MMBF[a]	Average MMBF/Year
1971-75	289.3	57.9
1976-80	284.3	56.9
1981-85	224.4	44.9
1986-90	221.0	44.2
1991-95	91.8	18.4
1996-2000	72.4	14.5

[a]Million board feet

Mining

The first major gold discovery in the subbasin was in June 1861, near Elk City. A placer mining boom followed, concentrated in the upper part of the basin. Hydraulic mining began in the mid-1860s resulting in thousands of cubic yards of sediment being washed into stream channels and rivers. The first dredge operated in the Elk City area in 1891. In 1902, the first ore processing mill, the "American Eagle," was built and full scale lode mining began. In upland areas, lode mines averaged a few acres in size and most work was completed with hand tools, which limited watershed impacts. However, the mills were located near streams for water and power supply, and it is likely that cyanide and mercury contaminated tailings were discharged into them.

The 1930s depression era brought a revival of placer mining and some lode mining. Most of the heavy dredging occurred in the tributaries (Newsome Creek, American River, Red River, and Crooked River), and in the upper section of the SF CWR main stem extending from the mouth of Newsome Creek to the upper reaches. Most of these impacts occurred in the lower gradient sections, which provide the richest spawning and rearing habitat.

Hydraulic mining of hillsides also revived in the 1930s. Large amounts of sediment caused changes in stream morphology as the volume was too great to be washed downstream. The pits left by hydraulic mining, called "glory holes" continue to be a focus of current restoration efforts. Their large, unvegetated, unstable banks are constantly eroding and contributing sediment to the system.

By 1960, more than 24 million cubic yards of material had been dredged in the subbasin, affecting approximately 30 miles of stream. Recent mining activity consists mostly of small scale suction dredging, placer and lode operations, and aggregate sources (rock pits). Approximately 70 aggregate sources have been developed in the subbasin over the years. Most are bank excavations above an entry road, and others utilize existing dredge tailings.

The USFS mining regulations have led to a reduction in mining impacts since 1974. One provision in these regulations requires that the operator furnish a bond to ensure that reclamation occurs. Environmental laws passed in the 1970s and 1980s have also reduced mining impacts.

Grazing

Domestic sheep and cattle arrived in the mid-1860s, with the gold rush and the movement of people to the area. It is estimated that more grazing by domestic livestock occurred at the turn of the century than occurs now. The NPT pastured large bands of horses throughout the area. It is also known that the NPT practiced prescribed fire management.

Livestock management increased with the number of settlers, and operations were concentrated in suitable areas around major trailheads leading to the large mining camps. Grazing laws were enacted in 1908 with the establishment of the NPNF. The livestock industry thrived on the range land of the area. Stites was the major livestock shipping location for the county.

Currently there are twelve active NPNF cattle allotments in the subbasin. The allotments are designated areas of land upon which a specified number of livestock may be grazed under a range allotment management plan. Grazing allotments total approximately 222,100 acres of the 515,000 acres within the NPNF portion of the subbasin. Approximately 105,450 of the allotment acreage have forage and are suitable for grazing. The rest is forested.

The degree of impact from grazing has fluctuated over the years. Recent monitoring indicates that the NPNF allotments are not major contributors to degraded fish habitat or water quality. However, about one third of the allotments have localized areas of overuse, which cause damage to stream banks and reduce riparian vegetation (USFS 1998).

Private, BLM, state, and tribal lands have been grazed by domestic livestock since the mid-1800s. The extent, location, and effects of the early grazing are not known. The earliest surveys done in Cottonwood Creek in 1962 documented riparian zones in poor condition and high water temperatures. Subsequent studies (1974, 1980, 1982, 1987, and 1992) all indicate a lack of riparian vegetation, lack of vegetative diversity, and severe channelization of the stream (USFS 1999). It is not known to what extent these impacts are attributable to grazing.

Outfitting/Guiding

There are currently seven different outfitters who utilize portions of the watershed for big game hunting (elk, deer, black bear, and cougar), fishing, and pack trips. There are currently no outfitter-guide permits for water related activities, such as rafting or kayaking.

Recreation

Recreation use includes big game hunting, fishing, horseback riding, hiking, cross-country skiing, swimming, whitewater kayaking, snorkeling and scuba diving, camping, photography, wildlife viewing, picnicking, arts and craft activities, outdoor learning, berry picking, wood cutting, off-road vehicle use, sight seeing, and recreational dredge-mining. The early trails and wagon roads provided access for the nearby prairie and river communities to hunt, fish, and camp in the NPNF. The main stem of the SF CWR and the Red River have most of the developed campgrounds on the forest. In 2001, the north-central Idaho chinook fishing season brought $46 million dollars to the region (IDC 2002).

Recreation/tourism has been a traditional and historic use of the SF CWR area for as long as 110 years. The gravesite of G. Colgate lies alongside Highway 12 in the nearby Lochsa River subbasin. In 1893, Colgate was cook for a group of easterners engaged in a guided hunt along the Lochsa River (Hendrickson 2002). According to 1999-2000 Idaho Department of Commerce (IDC) figures, tourism is second only to lumber in north-central Idaho in revenue generated. Agriculture is third. In Idaho County, the gap between lumber and tourism is smaller than in north-central Idaho as a whole (Laughy 2002). In 1997, travel and tourism expenditures were 47.4 million dollars and agricultural sales were 32.6 million dollars. The lumber industry (all sales of manufactured lumber products, including logging, trucking, milling, etc.) was estimated to have generated 50.5 million dollars in 2000. According to IDC, travel and tourism figures do not reflect the income of proprietors and thus is underestimated. In summary, the three major industries in Idaho County are agriculture, lumber/milling, and tourism. They are all of similar size, with agriculture being the smallest. Travel and tourism is the most rapidly growing industry, while the others are declining.

Agriculture

In the mid-1800s settlers began moving into the area and established homesteads and ranches. Larger tracts were put into crop production with the development of mechanized equipment, resulting in the loss of riparian areas and wetlands. Predominantly agricultural land use occurs in the Threemile Creek and Butcher Creek watersheds (Table 9).

Table 9. Percent land use in Threemile and Butcher Creeks.

Water body Segment	Cropland	Pasture and Range	Forest	Steep Canyons	Urban
Threemile Creek	63.5	12.3	4.7	14.6	0.3
Butcher Creek	53.9	35.2	2.0	8.7	0.2

The majority of cropland is devoted to dryland agriculture. About 10% of area farmers are now using direct seed and no-tilling practices, with the trend on the increase (Rowan, September 23, 2002). The major crops are winter wheat, spring wheat, barley, peas, lentils, and canola. Most of the cropland is on gently sloping, well-drained soils. Farming practices include conventional tillage for seedbed preparation, plow, disc, harrow, fertilization of inorganic nitrogen (on average 100 pounds per acre for winter wheat) and phosphorus, and pesticide application for control of weeds and insects. Crops are generally grown in rotation with winter wheat following a legume or canola.

Range and grazing lands tend to be on the steeper slopes or areas with soils unsuitable for crop production. Some areas have large numbers of animals confined to relatively small areas with direct access to the creek. Currently none of these areas are officially designated as “confined animal feeding operations” (CAFOs) (Rowan, September 23, 2002).

Approximately 60% of all private agricultural land has had riparian vegetation removed according to Idaho Soil and Water Conservation District representatives (USFS 1999). During spring runoff, flooding of cropland, pasture, and hay land adjacent to streams occurs. Little vegetation is left to trap sediments during these periods of runoff. Severe stream bank erosion has also occurred in some areas resulting from the high velocity flows associated with seasonal flooding.

The majority of cropland is left in a tilled condition going into winter. Soil erosion occurs following winter rains (November to March) on snow and frozen soil resulting in rapid runoff. When the soil is partially frozen, the surface water infiltration is greatly reduced and runoff erodes topsoil down to the frozen layer, carrying sediment onto lower lands and into stream systems. Localized high intensity rainstorms, which may occur at any time during the year, also contribute to soil erosion.

Agricultural chemical use on private land is widespread, and approximately two thirds of the cropland area receives at least one chemical application per year. Appendix E lists chemicals identified as being used in support of agriculture and grazing on the Camas Prairie. Approximately 46 different herbicides and pesticides are used on the Camas Prairie for weed and insect control (Sandlund 2002).